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Semi-Volatile Organic Compounds in Snow Collected at National Parks in the Western United States

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Abstract:

Semi-volatile organic compounds (SOCs) are known to undergo atmospheric long-range transport and deposition to cold environments at high elevations and latitudes. In response to concerns regarding SOC deposition to its high-elevation and latitude ecosystems, the United States National Park Service initiated a 5-year project entitled the "Western Airborne Contaminants Assessment Project (WACAP)." Snow is one of the key ecosystem components being interrogated by WACAP due to its suspected role in delivering SOCs to western national parks. Thus, annual snowpack samples (~50 kg) are being collected at 8 different national parks in 2003, 2004, and 2005. Results from samples collected in the spring of 2003 will be discussed. Target analytes included current- and historic-use pesticides, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs). SOCs were extracted from melted snow by solid-phase extraction (SPE) with modified hydrophilic/hydrophobic *Speedisks*TM. Samples were analyzed by gas chromatography with mass spectrometry and quantified against stable-isotope labeled surrogates. Chlorpyrifos, dacthal, and endosulfan are examples of detected SOCs that are currently used in the U.S. Dieldrin, chlordane, and polychlorinated biphenyls are examples of detected SOCs that are currently banned from use in the U.S. Overall, concentrations of current-use SOCs were higher than those of banned SOCs. In some cases, significantly different concentrations of current-use SOCs were observed between parks, indicating that the distribution of SOCs between parks is influenced by regional sources. As an example, snow from Sequoia National Park (NP) contained 25 times more chlorpyrifos than that from Rocky Mountain NP and 85 times more than that from Denali NP. Isomeric ratio analysis also indicated that, in some cases, sources of current-use SOCs varied between parks. Concentrations of banned SOCs varied less between parks than those of current-use SOCs, indicating that banned compounds are more equally distributed in the northern hemisphere than current-use SOCs.